



## Moped use – fact sheet: Delnotat II

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## **Notat**

**Til** Transport-, Bygnings- og Boligministeriet

**Vedr.** Forskningsprojekt om aldersgrænsen for erhvervelse af kørekort til stor knallert og lille motorcykel.

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DTU Management Engineering

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Moped use – fact sheet

Delnotat II

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## 1 Objective

The purpose of this fact sheet is to provide an overview of selected aspects regarding moped use and moped users in Denmark with regard to the period from 2013 to 2018.

It is commonly thought that mopeds are a means of transport used primarily by young people. However, based on the current analysis it appears that the usage of mopeds also applies to middle-aged men who are more likely, not to hold a driver license. Additionally, the usage of mopeds is not just an urban phenomenon but also regards the countryside.

## 2 Methodology

The data utilized in the current analysis was obtained from The Danish National Travel Survey, which consists of an interview survey that documents the travel behaviour of the Danish population between the ages of 10 and 84 years<sup>1</sup>. The number of responses regarding moped users constitutes 578 out of a total of 159.462 responses. Since this work aims to analyse the current usage of mopeds, we only examine data from the last five years (November 2013 to October 2018). Considering more years could affect the representation of the current state; while, considering less years would increase the uncertainty of the results. Notice that the results are presented without any indication of the confidence interval and the reader must be aware of the existence of an implicit uncertainty. However, we tested the level of uncertainty in some instances and the results are shown in subsection 1.1.

We include two types of mopeds in the analysis: moped 30 and moped 45. The maximum speed of the first one is 30 km/h and the minimum user age is 15 years, while, the maximum speed of the second one is 45 km/h and the minimum user age is 18 years. In the analysis we do not distinguish between mopeds 30 and 45; but we include both in all analysis. This is done to ensure enough data.

We evaluate the usage of mopeds by either calculating the share of the total km driven or the average trip length for particular categories. These categories are based on geographical usage, temporal usage, user age and user characteristics. Moreover, we divide all the results into two categories: urban area and rural area, based on population city size. The category: *urban area* includes the municipalities of the nine largest cities in Denmark: Copenhagen, Odense, Aarhus, Esbjerg, Kolding, Vejle, Horsens, Randers and Aalborg. While, the rest of the country is considered *rural area*.

### 2.1 Example of confidence interval

The purpose of this section is to give an idea of the size of the uncertainty; therefore, any kind of comment or explanation of the results presented is missing. However, the first example can be found in section 2.2, the second in section 2.6.

The two examples presented in this chapter are based on data collected from 2013 to 2017; this is because the calculation of the confidence interval for the data collected during the 2018 is not currently available. In this report, we decided to also include 2018 because The Danish National Travel Survey has collected a particular amount of responds from moped users during the last year.

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<sup>1</sup> In 2016 it was expanded to include persons as young as 6 years old.

Given that the size of the confidence interval also depends on the population size, it can be assumed that the confidence interval related to the rest of the report is not wider than the one shown here.

The first example regards the share of the total km driven in six macro areas of Denmark. The macro areas are explained in detail in section 3.2. Figure 1 and table 1 below include information on the 95% confidence interval.

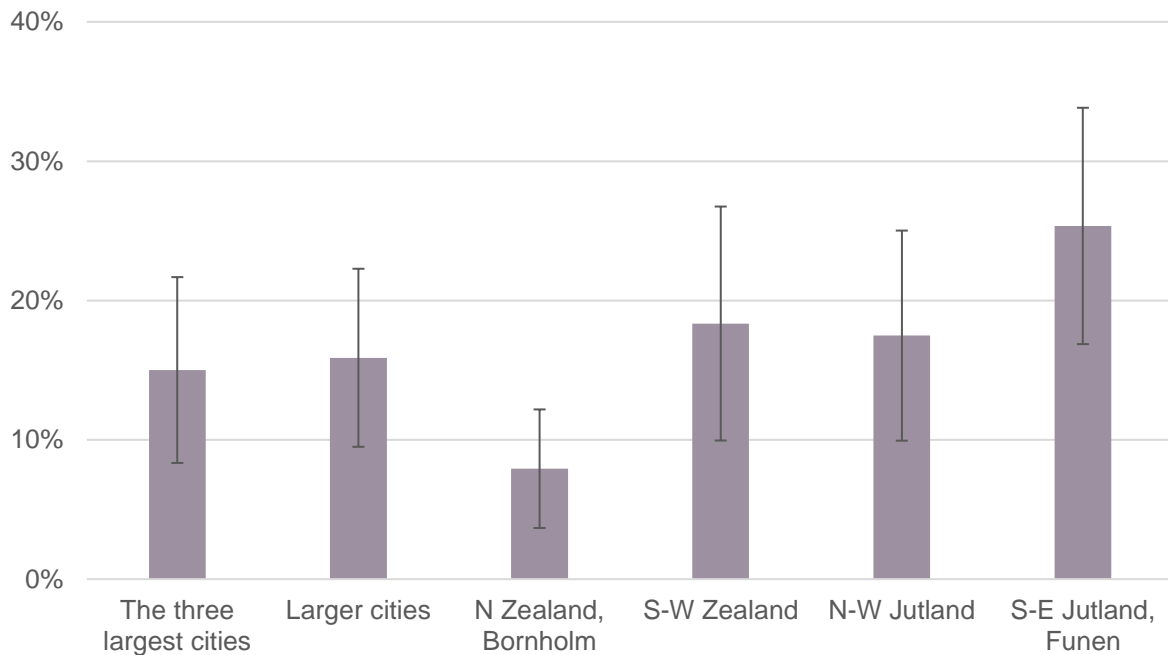


Figure 1: Share of the total km driven by macro area.

Table 1: Share of total km driven by macro area

Macro Area	Exposure		Share of km driven	
	Millions of km	Confidence Interval	Proportion	Confidence Interval
The three largest cities	11,0	[6,1 - 15,9]	15,0%	[8,3% - 21,7%]
Other large cities	11,7	[7 - 16,4]	15,9%	[9,5% - 22,3%]
N Zealand, Bornholm	5,8	[2,7 - 9]	7,9%	[3,7% - 12,2%]
S-W Zealand	13,5	[7,3 - 19,7]	18,3%	[9,9% - 26,7%]
N-W Jutland	12,9	[7,3 - 18,4]	17,5%	[9,9% - 25%]
S-E Jutland, Funen	18,6	[12,4 - 24,9]	25,4%	[16,9% - 33,8%]

Similarly, the second example (figure 2, table 2) regard the km share by trip purpose and also include information on the 95% confidence interval.

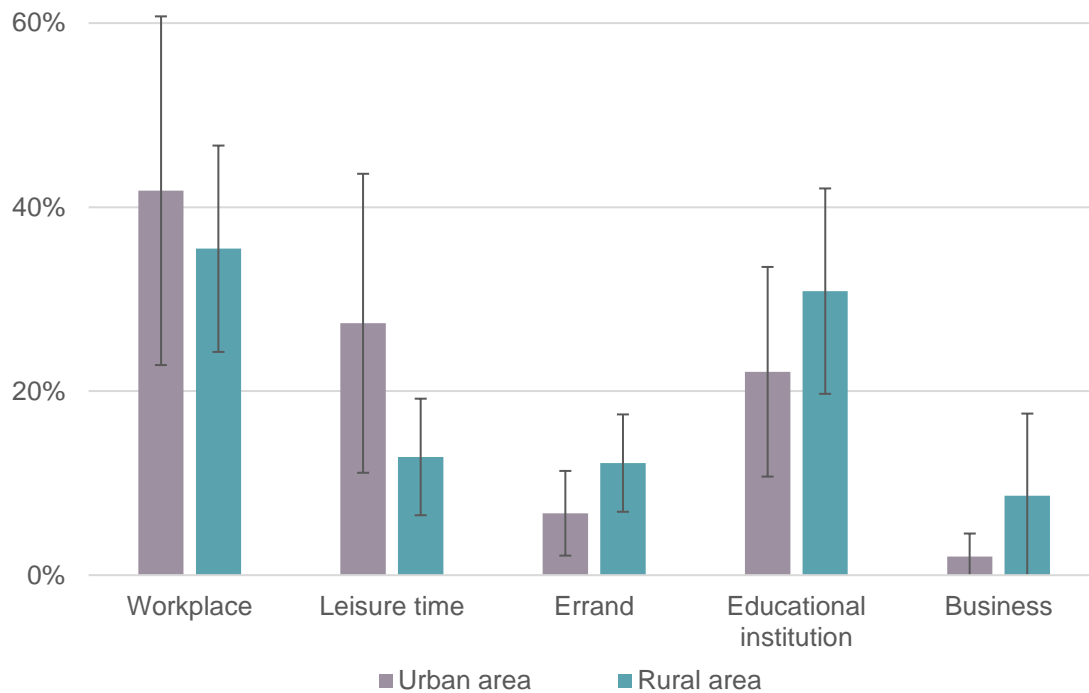


Figure 2: Share of total km driven by trip purpose.

Table 2: Share of total km driven by trip purpose.

Trip Purpose	Urban		Rural	
	Share	Confidence interval	Share	Confidence interval
Workplace	41,8%	[22,8% - 60,7%]	35,5%	[24,3% - 46,7%]
Leisure time	27,4%	[11,1% - 43,6%]	12,8%	[6,5% - 19,2%]
Errand	6,7%	[2,1% - 11,3%]	12,2%	[6,9% - 17,5%]
Educational institution	22,1%	[10,7% - 33,5%]	30,9%	[19,7% - 42%]
Business	2,0%	[-0,5% - 4,5%]	8,6%	[-0,3% - 17,6%]

### 3 Results

#### 3.1 Share of km driven among all the means of transport

We compare the use of modes with the use of other modes. The results are divided into groups based on user age and on the possession of a driving license. Notice that the category *All the population* includes all persons from 10 to 84 years old while the categories *Yes driving licence* and *No driving licence* not only include persons from 18 to 84, but from 2017, also the 17 year olds. The category named *Car* includes not only car drivers but also car passengers.

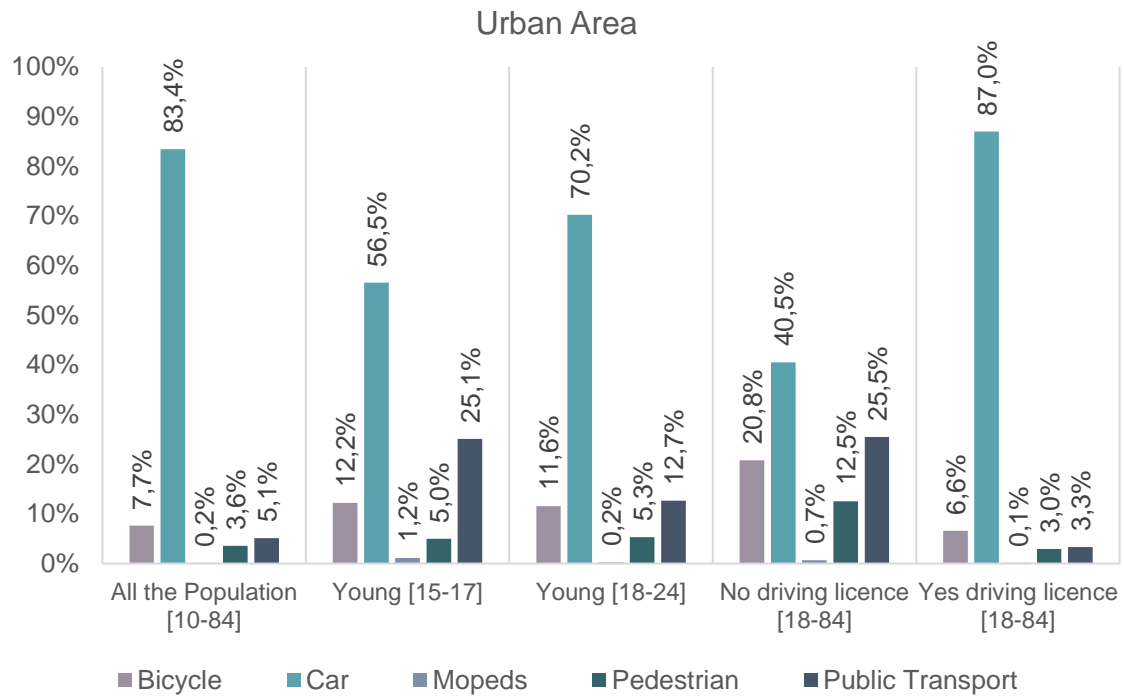


Figure 3: Share of the total km driven by all the means of transport in urban area

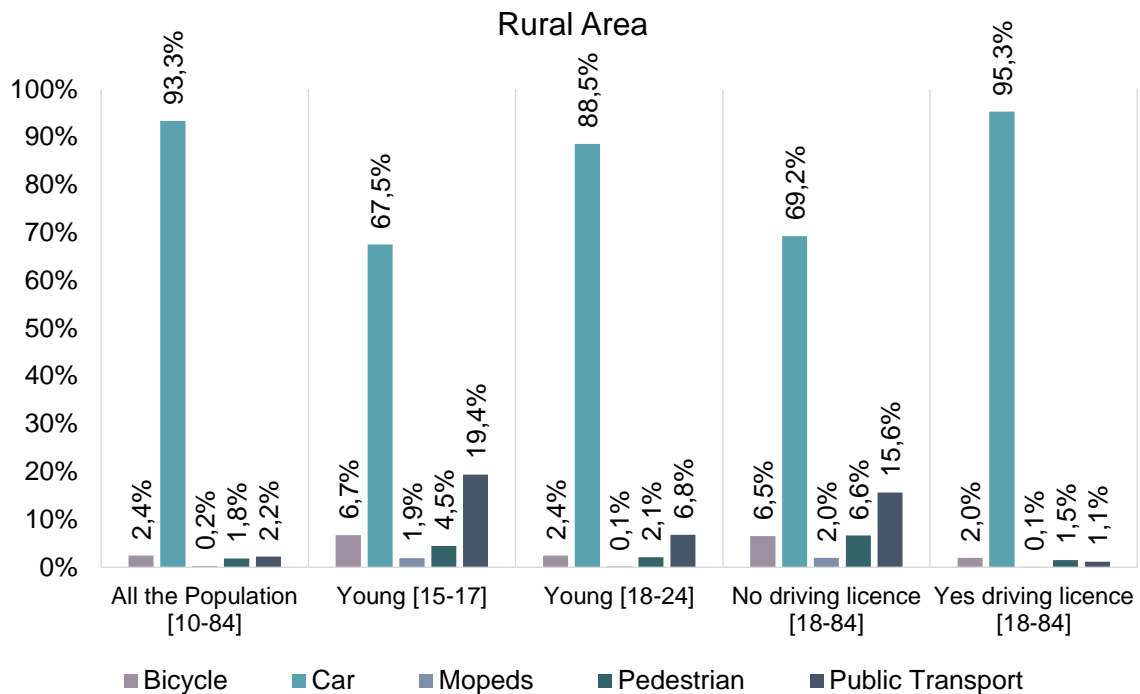


Figure 4: Share of total km driven by all the means of transport in rural areas

As can be seen from Figure 3 and table 3 the share of the total number of km driven by mopeds in Denmark is very low, compared to the other means of transport. This indicates that, a moped is not a commonly used mode of transportation. It can be noticed, that the share of km driven by mopeds differs across age groups and among people with and without a driving licence. This indicates that the use of the moped differs between different subgroups of people, and that some subgroups use the moped more than others do. In order to make this comparison easier, the values of moped shares are extrapolated and presented in Figure 5.

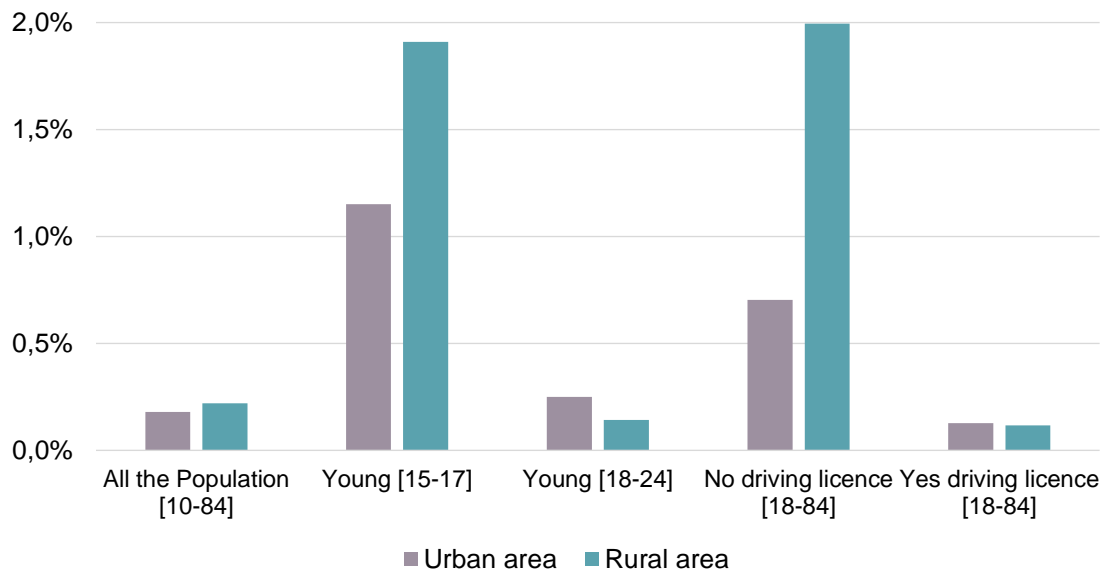


Figure 5: The moped share of the total km driven in subgroups of the population.

From figure 5 it can be noticed that the two highest moped shares are found among persons who are not allowed to drive a car alone: *People who do not have a driving license and young persons aged 15 to 17*. This leaves the impression that mopeds are more likely to be used as an alternative to public transport or bikes when cars are not accessible particularly in rural areas. Further studies are needed to clarify this, but it may be related to a lower availability of public transport and bicycle infrastructure in rural areas. Section 3.12 presents an analysis of the availability of public transport in Denmark.

In order to investigate further, the possible correlation between the possession of a driving license and moped use, we calculate the number of moped users in possession of a driving license, and compare the results with the national average. The category *under 18* intends to represent the people who are not entitled to hold a driving license; thus, starting from 2017, the 17 year olds are no longer included in that category. Therefore, the other categories include people from 18 to 84 years of age, before 2017 and from 17 to 84 years onwards.



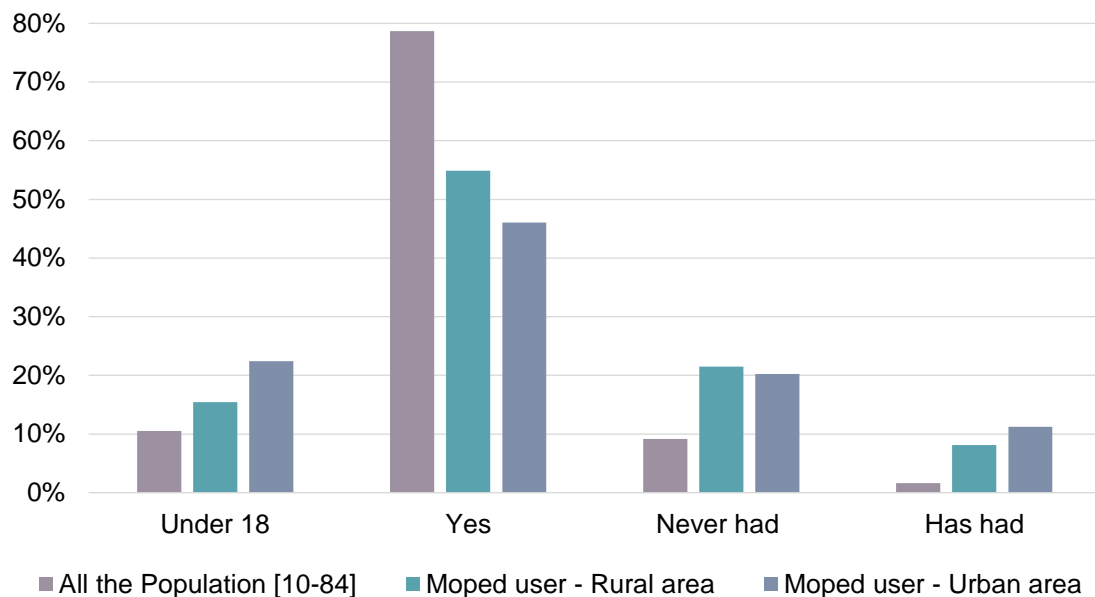


Figure 6: A Comparison between all persons aged 10–84 and moped users based on driving license.status.

Generally, the results in Figure 6 show, that moped users are more likely not to have a driving license than the average person is. Noteworthy, 3 out of 10 adult moped users do not have a driving license, although one of them used to.

### 3.2 Macro Areas

In order to investigate the geographical usage of mopeds, Denmark was divided into six macro areas<sup>2</sup>. These macro areas are:

- The three largest cities: Copenhagen, Odense, and Aarhus
- Larger cities: Esbjerg, Kolding, Vejle, Horsens, Randers, and Aalborg
- Countryside North Zealand and Bornholm
- Countryside South and West Zealand
- Countryside North and West Jutland
- Countryside Funen, South and East Jutland

The grouping of the urban macro areas is based on population city size and population density, whereas the rural areas have been divided into four areas in order to increase the level of detail and to capture social differences.

In some analysis, the first two and the last four macro areas are merged to create two group: urban area and rural area. We do this to create a simpler classification and to increase the number of observations for a category when necessary.

<sup>2</sup> For further details see delnotat I: Møller et al. (2018). Scenarieregninger for knallert 45 og lille motorcykel. Delnotat I. DTU Management Engineering 2018.

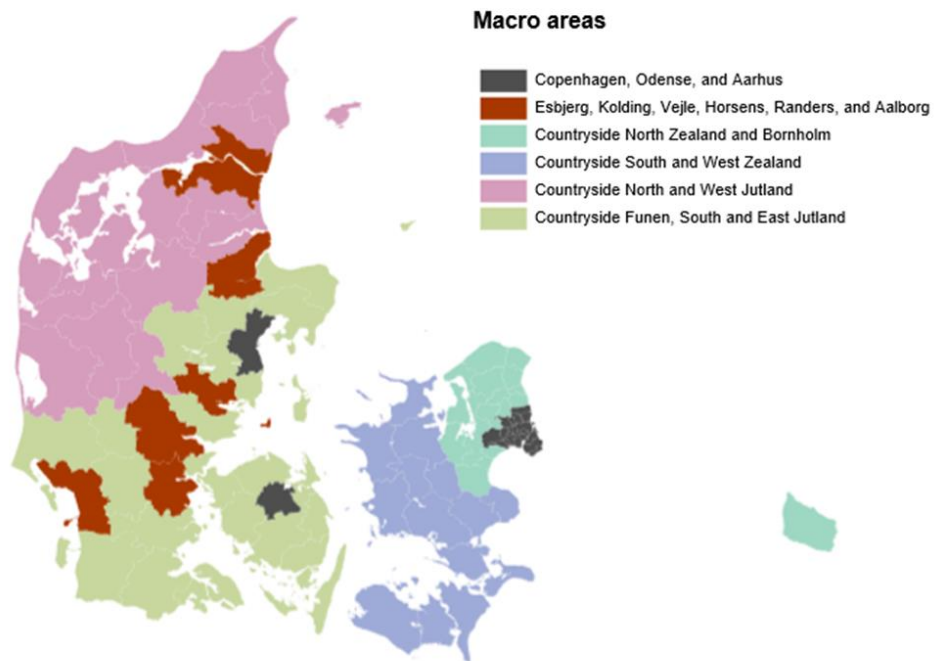


Figure 7: The six macro areas used in the analysis

For each of the macro areas, we calculated the share of the total km driven by moped (Figure 8).



Figure 8: Share of the total km driven by macro area.

Figure 8 shows that the largest share of the total kilometres driven by moped is driven in South-East Jutland, Funen, and North-West Jutland. The smallest share of the kilometres is driven in North-Zealand. Thus the number of km driven by moped in Jutland and Funen are considerably higher than in Zealand. Indeed, almost half (45%) of the total km are driven in the western part of Denmark.

Moreover, it has been calculated that within the following macro areas *The three largest cities* and *Larger cities*, the number of km driven per inhabitant is 0,4; while within the remaining macro areas, the km per inhabitant are 13. Based on this, mopeds are more common in rural areas than in urban areas. It follows the average trip length for macro areas.

Figure 9 shows the average trip length by macro area. As can be seen the lowest value has been obtained from the category *The three largest cities*.

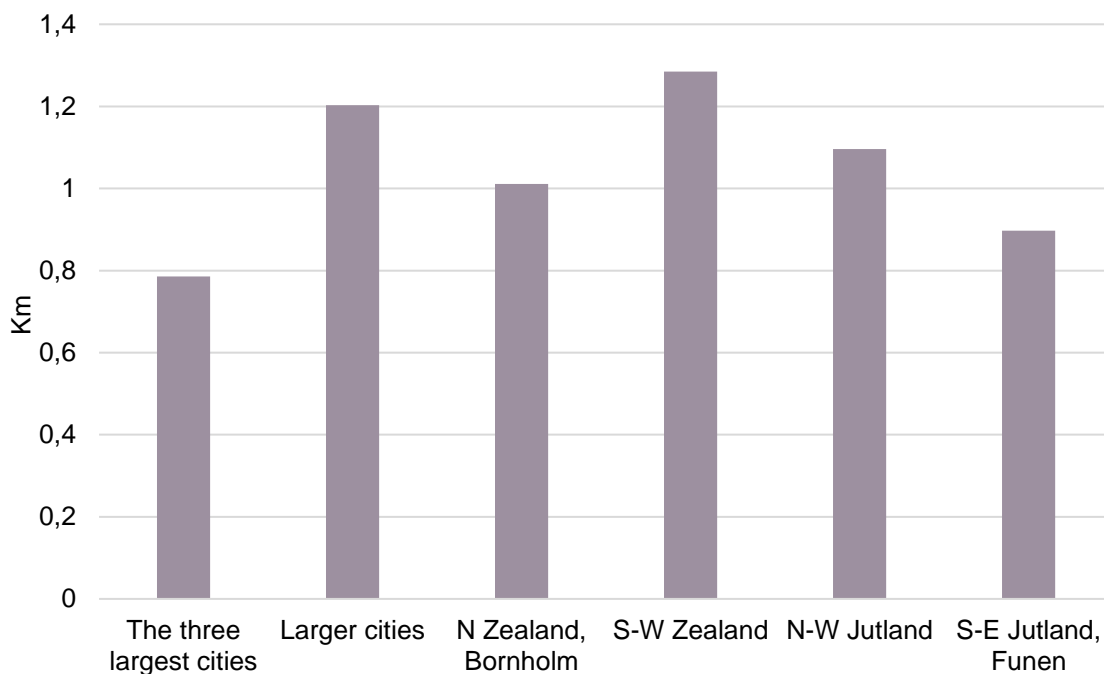


Figure 9: Average trip length by macro area.

### 3.3 Trip share by travel time

In order to further investigate the moped use, we calculate the proportion of moped trips based on trip duration (see Figure 10 and 11). The results are grouped by age and, for this analysis, Denmark was divided into: Urban area and Rural area. The urban area includes the following macro areas; *The three largest cities* and *Other large cities* while the rural area includes the remaining macro areas.

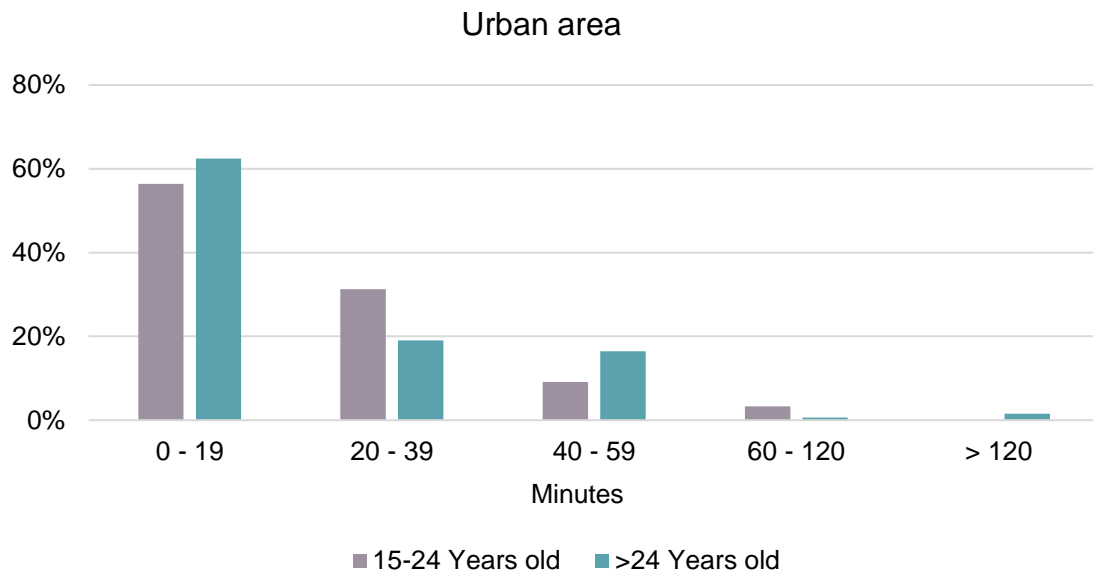


Figure 10: Trip share by trip duration, Urban area.

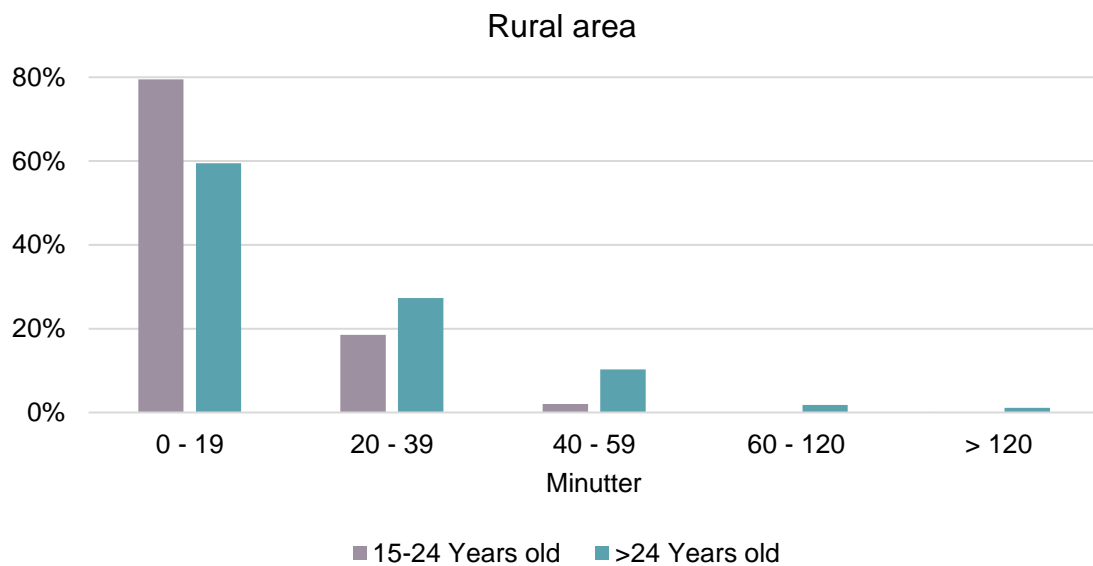


Figure 11: Trip share by trip duration, Rural area.

The results shown in Figure 10 and 11 shows that more than half of the current moped trips have a duration shorter than 20 minutes. The number of trips decrease along with the duration. As expected, the number of trips longer than one hour is very low.

In comparison with urban area, the share of trips shorter than 20 minutes is higher in rural area.

### 3.4 Trip share by trip length

In this section, we calculate the proportion of trips based on trip length. The results are grouped by age and by geography (macro areas). Figure 10 shows the results regarding urban area, and Figure 11 shows the results regarding rural area.

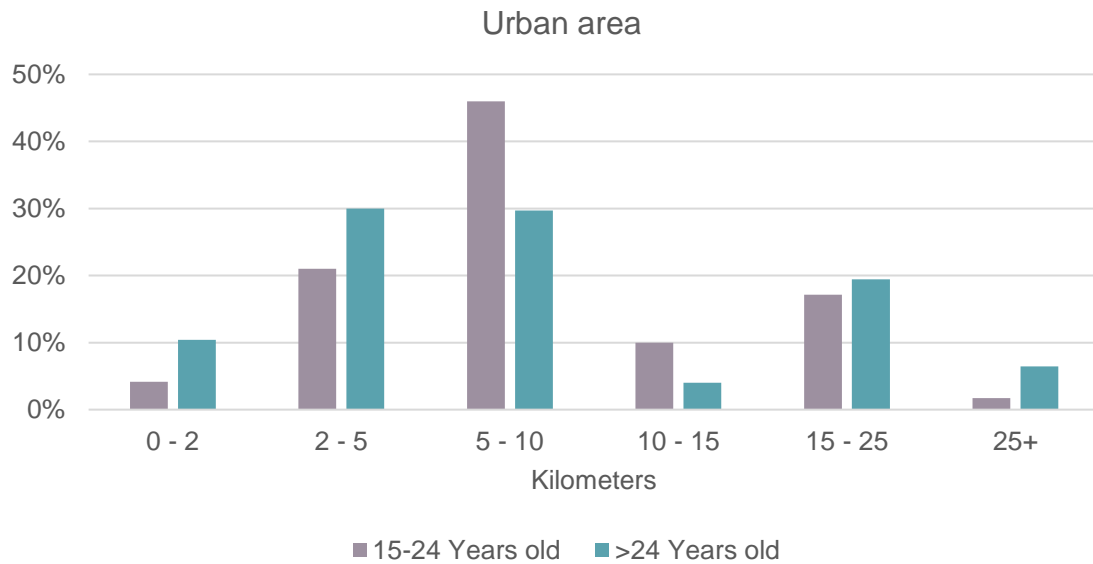


Figure 12: Trip share by trip length, Urban area.

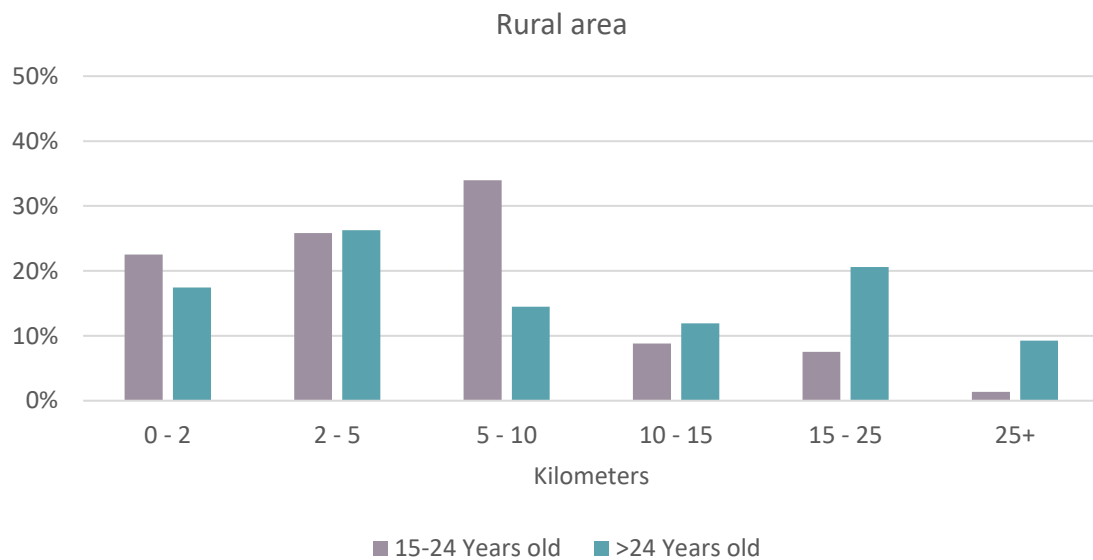


Figure 13: Trip share by trip length, Rural area.

As shows in Figure 12 and 13, the most common trips among young moped drivers are 5-10 km. While, for adults, 60% of all the trips range from 2 - 10 km. As expected, the number of trips longer than 25 km is very low.

### 3.5 Average trip length

In this section, we investigate the average trip length for each of the 6 macro areas.

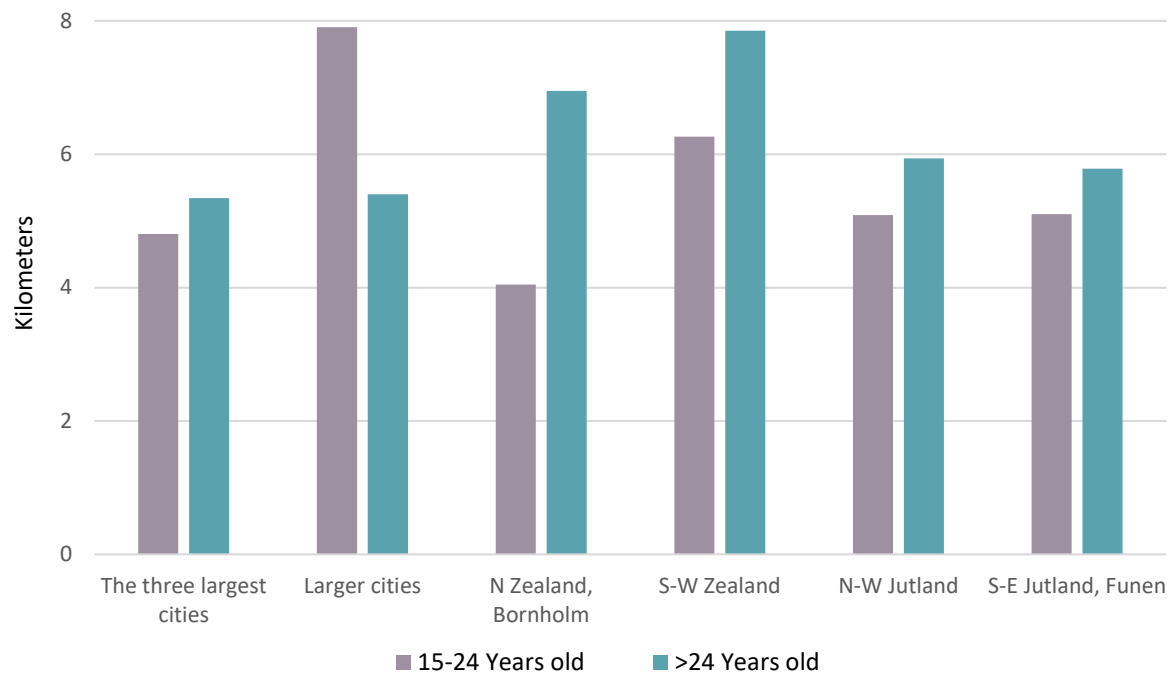


Figure 14: Average trip length.

Results show that the average moped trip length in Denmark, among all the users, is 5.9 kilometers. No significant pattern between urban and rural area or between adult and young users appear.

### 3.6 Average trip duration

In this section, we investigate the average trip duration for each of the 6 macro areas.

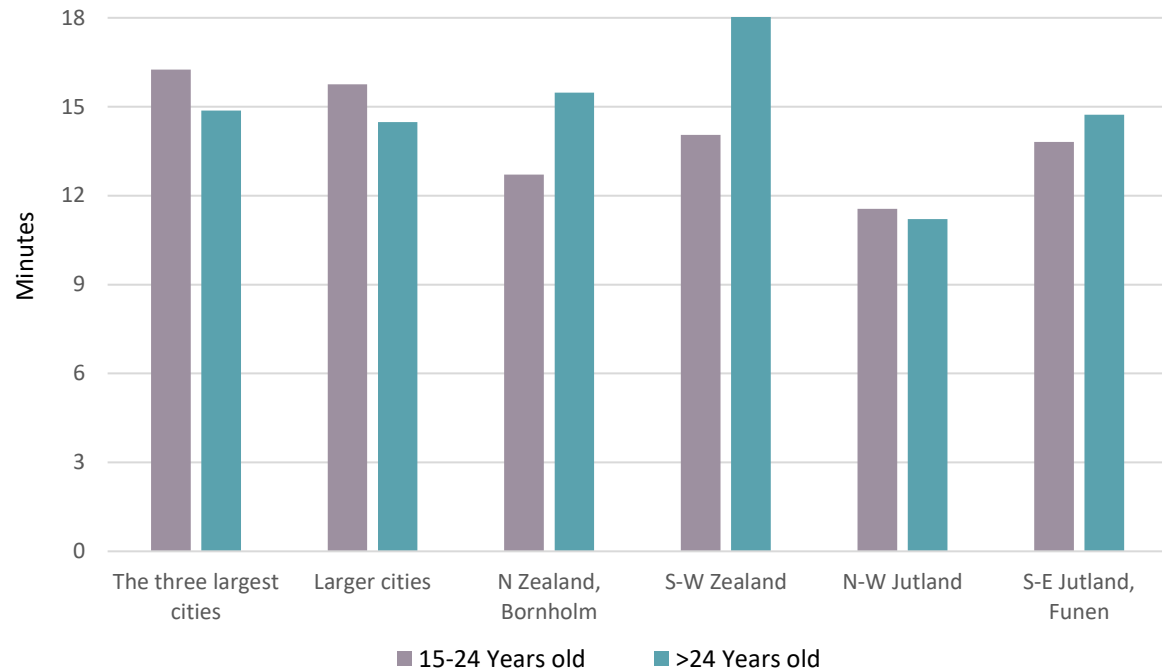


Figure 15: Average moped trip duration.

Results show that the average moped trip duration in Denmark, among all the users, is 14.4 minutes. No significant pattern between urban and rural area or between adult and young users appear.

### 3.7 Variation over the years

We examined the variation of the number of km driven by moped for the period of 2006 to 2017, in order to reveal possible increasing or decreasing trends. As before, we divide Denmark in Urban and Rural areas. The shaded area in the charts represents the 95% confidence interval.

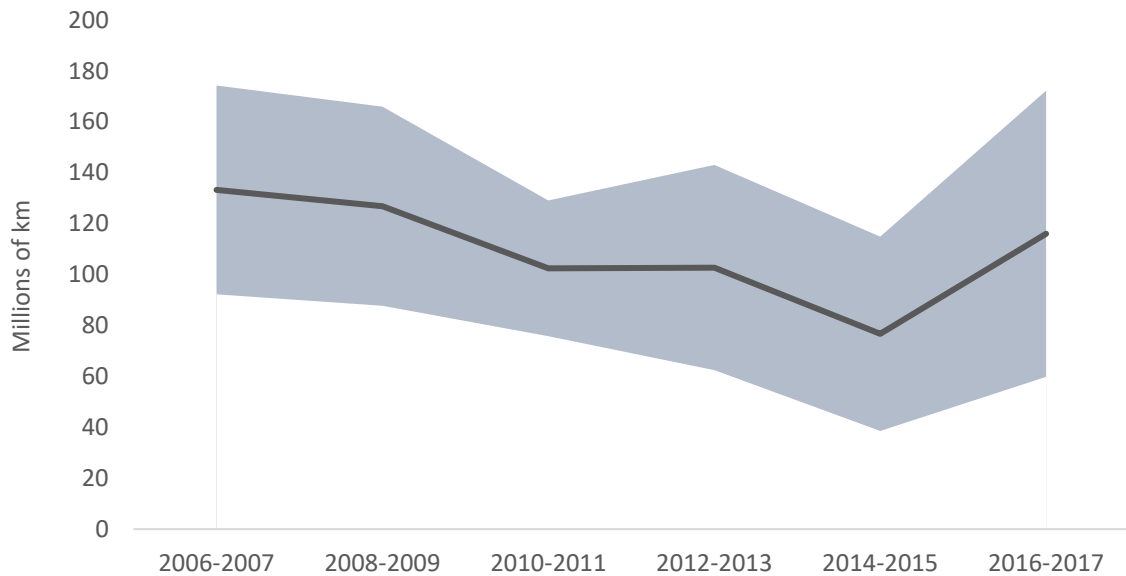


Figure 16: Variation of the usage of mopeds (moped 30 and 45) over the last 12 years in urban areas.

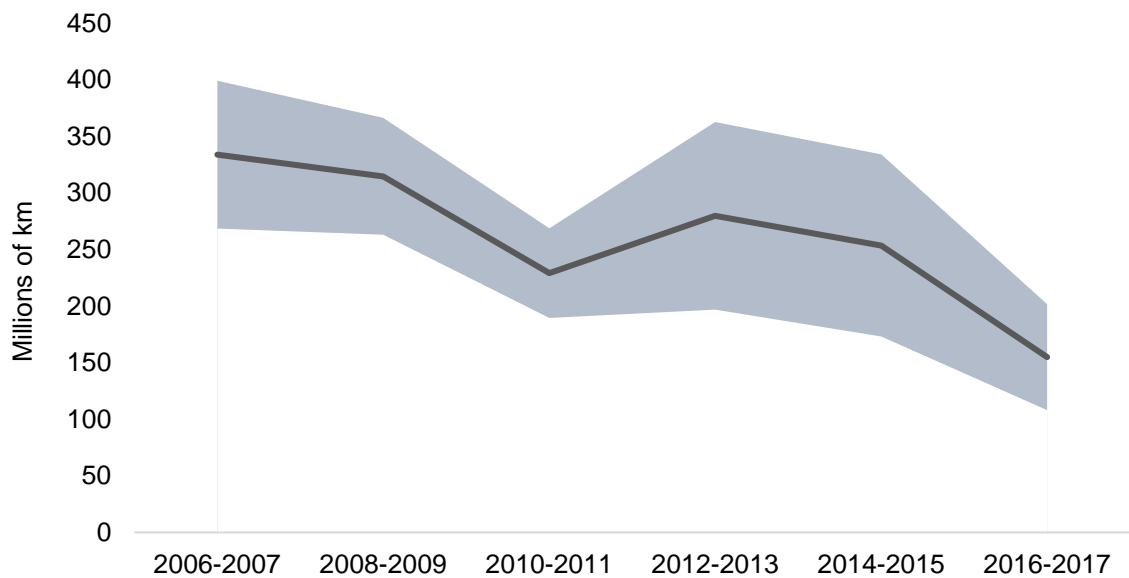


Figure 17: Variation in the usage of mopeds (moped 30 and 45) over the last 12 years in rural areas.

Given the continuous increase in the population and the increased car use in Denmark, it would be reasonable to expect an increase in the overall moped use too. However, not only is the use of



mopeds not increasing, it is actually decreasing. It can be argued that the total km driven is going up on the biennium 2016 to 2017 in urban areas (Figure 16). However due to the large confidence interval it is really not possible to make conclusions. Also, it should be taken into account, that the minimum age limit for the moped 30 was reduced from 16 to 15 on October 1<sup>st</sup>, 2016. The same possible increase is not observed in the rural areas, which is likely because the 15 year olds only represent a small proportion of the total users.

### 3.8 User sex

When investigating role of moped users sex, it is clear that males drive mopeds much more than females (Figure 18).

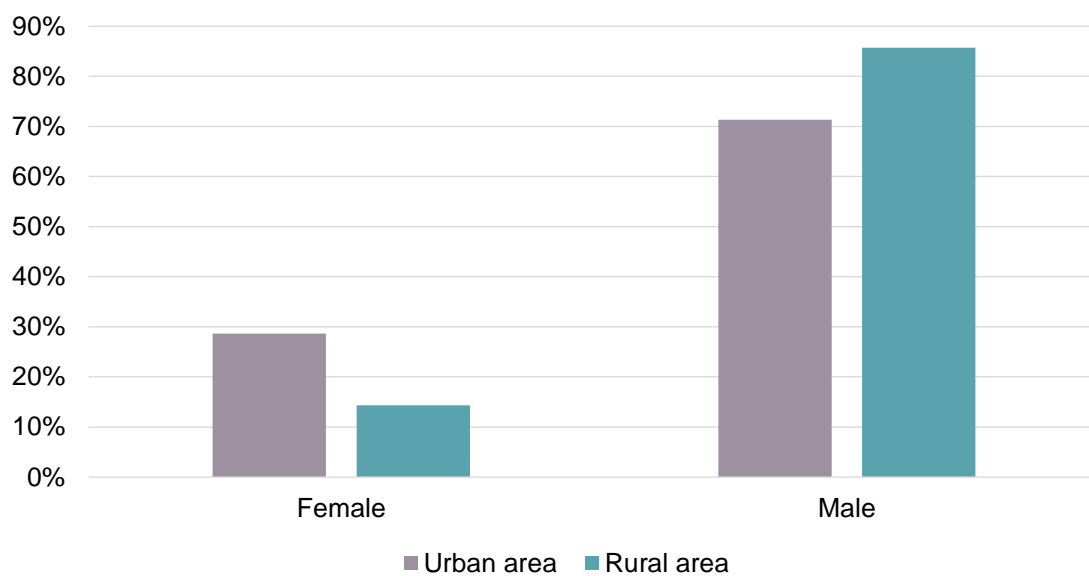


Figure 18: Share of total km driven by moped by user sex

### 3.9 Trip purpose

In order to understand in which situations people drive mopeds, the share of total km driven by moped 30 and 45 has been analysed based on *trip purpose* (figure 19).

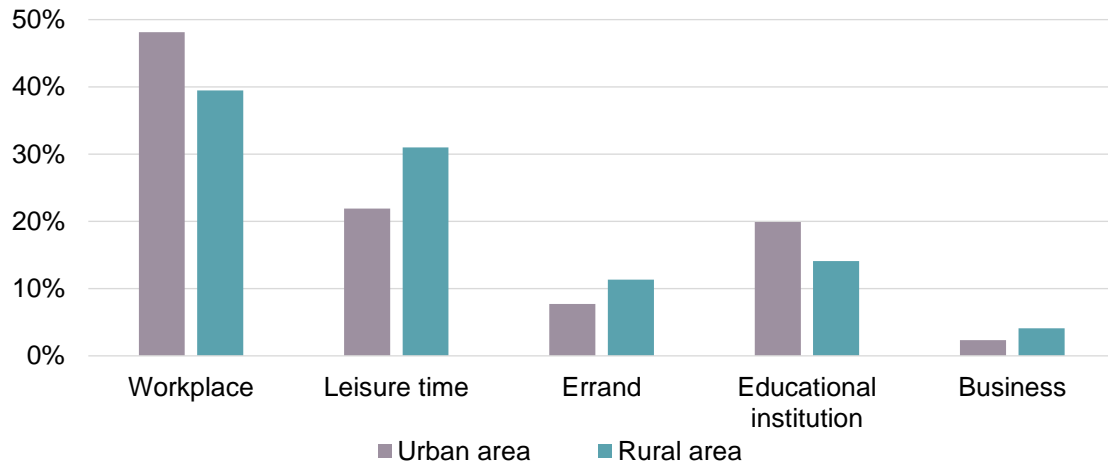


Figure 19: Share of total km driven by trip purpose.

Figure 19 shows that the largest share of kilometres driven on mopeds is related to workplace commutes, followed by leisure time commutes and commutes to an educational institution. This is true for urban as well as rural areas. Figure 19 also indicates a difference between the use of mopeds in urban and rural areas as the distribution of kilometres indicates, that in urban areas a larger share of the kilometres are work or school related, whereas in rural areas a larger share of the kilometres are related to leisure and errands.

Given the low share of total km driven by mopeds for education related trips, we decided to investigate how students commute to school. Figure 20 shows the share of the total km driven for educational related purposes by means of transport.

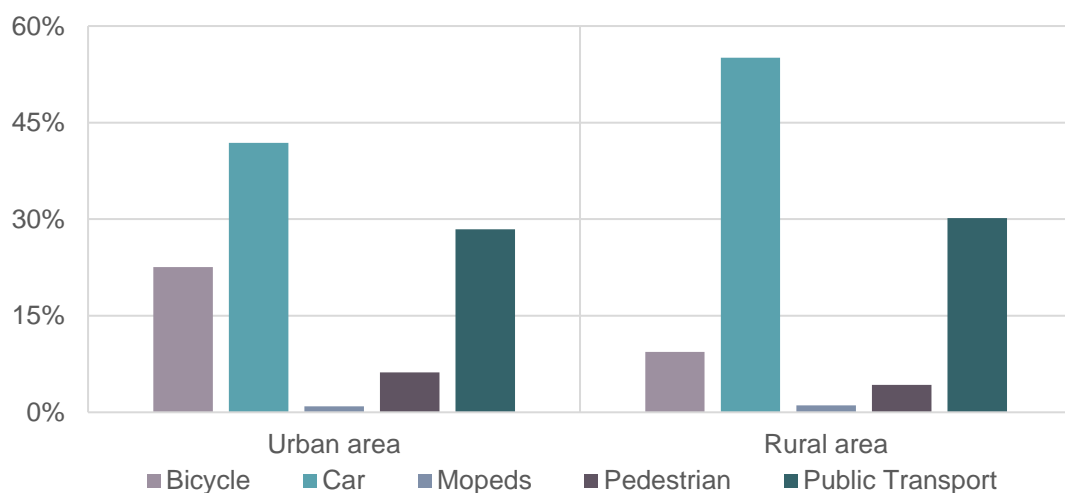
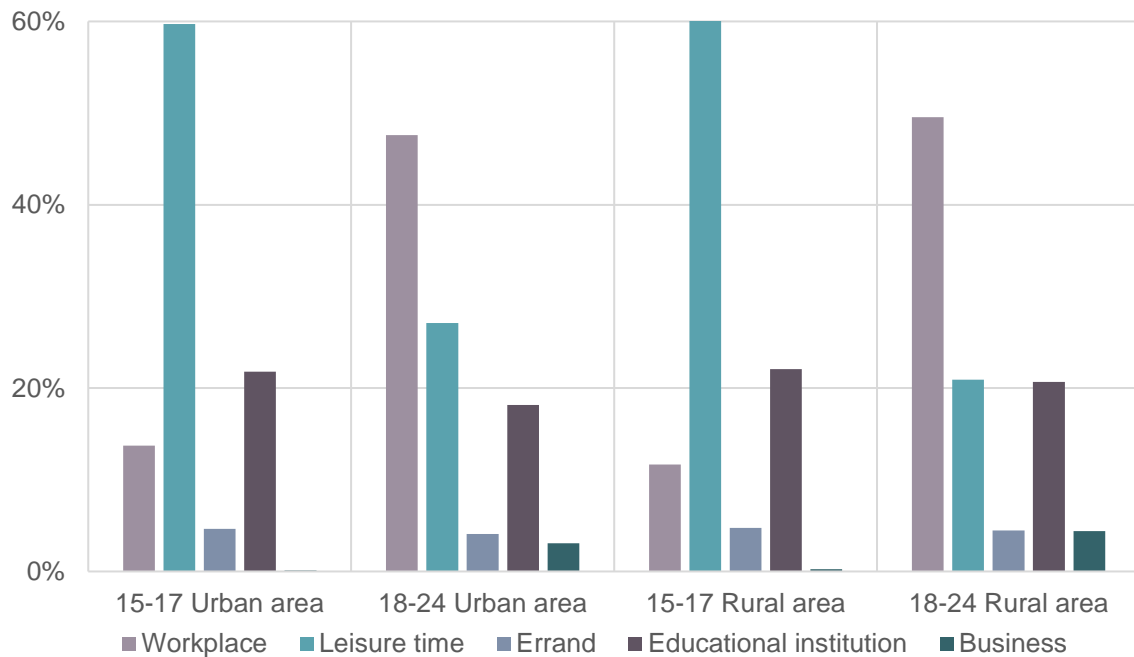


Figure 20: Share of total km driven by trip purpose.

Figure 20 shows that generally, students do not tend to drive mopeds to school, instead, they tend to take cars, public transport and, in urban areas, bicycles.

In order to provide a more detailed analysis on the usage of mopeds by young users, a chart showing the share of the total km driven by trips purpose by young users is provided below (Figure 21). However, it is important to be aware, that the chart is based on very small numbers.



*Figure 21: Share of total km driven by moped by trip purpose for young users.*

It appears that the proportion of errand, educational and business related trips tend not to change in the different categories. However, one main difference can be noticed: 15 to 17 year old users drive mostly for free-time related purposes, while 18-24 year old users drive mostly in connection with the commute to the workplace.

### 3.10 Seasonality

It is reasonable to think that the usage of mopeds depends on weather conditions, for this reason, we calculate the share of total km driven for each season. Notice that the season has been approximated as aggregation of 3 months starting from winter as aggregation of December-January-February.

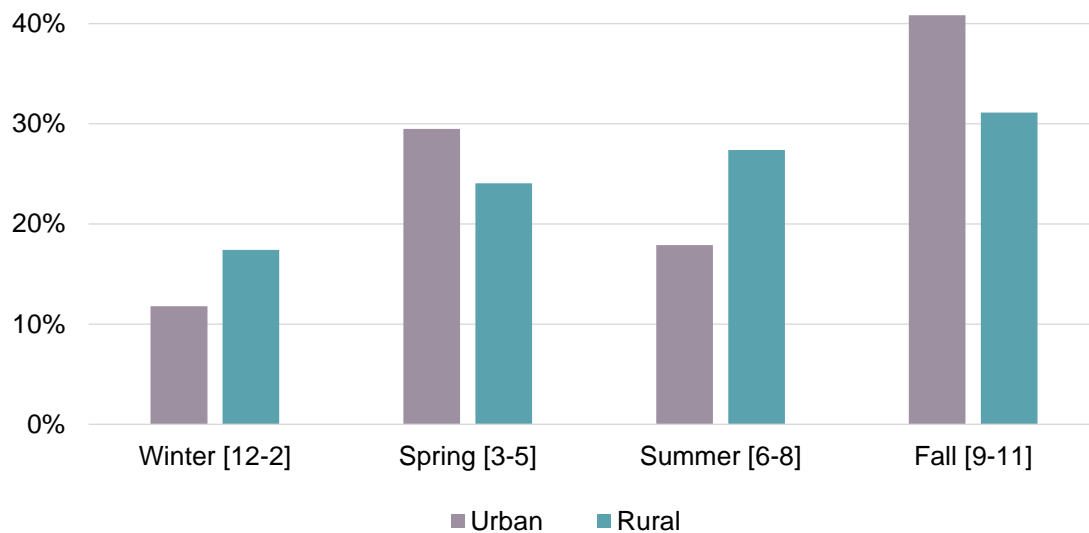


Figure 22. Share of total km driven by season.

Mopeds are least used during Winter Time when compared with the other period of the year. The difference in moped use between Winter Time and the other season is clear in urban areas while it is lower in rural areas. This can be due to less availability of transport alternatives in rural areas such as public transport.

### 3.11 Public transport availability

Given that differences in the availability of public transport in urban and rural area may influence transport related mode choice, we show the results of an analysis of the number of departures in Denmark below (figure 23). The map shows the ratio between daily departure and area for each municipality. Moreover, it is possible to distinguish between the macro area given the coloured borders and the numbers.

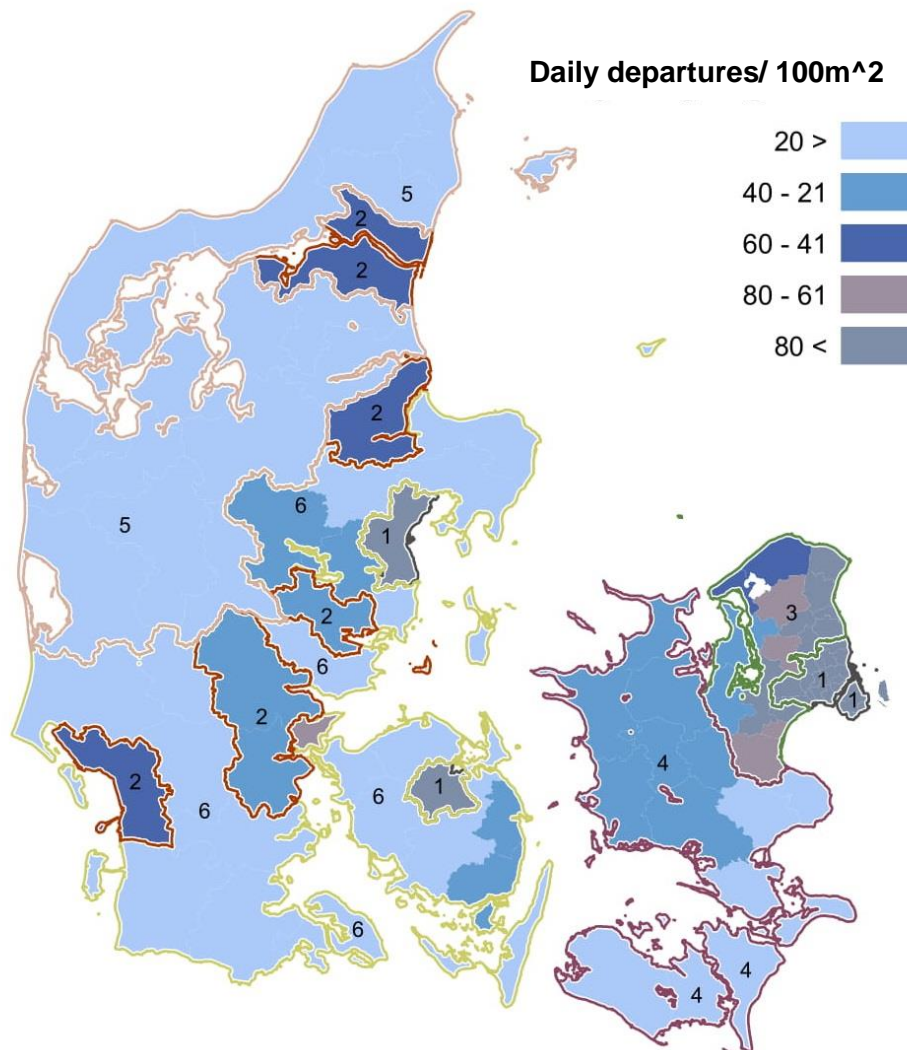


Figure 23 The ratio between daily departure and area for each municipality.

Figure 23 shows, as expected, that the availability of public transport is higher in urban areas than in rural area.

## 4 Conclusion

Based on The Danish National Travel Survey this fact sheet provides an overview of selected aspects of the moped use and the users. The overview is based on data from 2013 to 2018.

The use of mopeds in Denmark is limited. To ensure enough data the two moped categories, moped 30 and moped 45, were therefore both included in all analysis.

More males than females drives a moped, but results confirm that moped use is limited. The kilometres driven on mopeds constitute less than 2,5% of the total kilometres driven. The moped is used more in rural areas compared to urban areas 0,4 km per citizen in urban areas compared to 13 km per citizen in rural areas.

The overview showed that moped is more common among persons who do not have a driving license. Some of the moped users never had a license (probably because they are still young), whereas others no longer has a license.

With regard to geographical differences, the analysis showed that the largest share of the total number of moped kilometres are performed in South-East Jutland and Funen, and the smallest share in North-Zealand. However, on average people driver the longest trips in South-West Zealand and the larger cities.

More than half of the trips last less than 20 minutes and the share of trips with a duration of less than 20 minutes is higher in rural areas. For young moped users (15-24 years old) the most common trip is a trip of 5-10 kilometres. Young moped users mainly use the moped for leisure related trips rather than work or educational related trips.

## 5 Appendix

Table 3: Share of total km driven by mean of transport, Urban area

Category	Millions of Km	Means of transport	Share
All the Population [10-84]	1.819	Bicycle	7,7%
	19.808	Car	83,4%
	43	Mopeds	0,2%
	856	Pedestrian	3,6%
	1.221	Public Transport	5,1%
Young [15-17]	74	Bicycle	12,2%
	342	Car	56,5%
	7	Mopeds	1,2%
	30	Pedestrian	5,0%
	152	Public Transport	25,1%
Young [18-24]	286	Bicycle	11,6%
	1.733	Car	70,2%
	6	Mopeds	0,2%
	130	Pedestrian	5,3%
	313	Public Transport	12,7%
No driving license [18-84]	274	Bicycle	20,8%
	534	Car	40,5%
	9	Mopeds	0,7%
	165	Pedestrian	12,5%
	336	Public Transport	25,5%
Yes driving license [18-84]	1.389	Bicycle	6,6%
	18.302	Car	87,0%
	27	Mopeds	0,1%
	621	Pedestrian	3,0%
	699	Public Transport	3,3%

Table 4. Share of total km driven by mean of transport, Rural area

Category	Means of transport	Millions of Km	Share
All the Population [10-84]	Bicycle	1.073	2,4%
	Car	41.260	93,3%
	Mopeds	98	0,2%
	Pedestrian	797	1,8%
	Public Transport	992	2,2%
Young [15-17]	Bicycle	76	6,7%
	Car	764	67,5%
	Mopeds	22	1,9%
	Pedestrian	51	4,5%
	Public Transport	220	19,4%
Young [18-24]	Bicycle	88	2,4%
	Car	3.211	88,5%
	Mopeds	5	0,1%
	Pedestrian	76	2,1%
	Public Transport	247	6,8%
No driving license [18-84]	Bicycle	103	6,5%
	Car	1.093	69,2%
	Mopeds	32	2,0%
	Pedestrian	105	6,6%
	Public Transport	247	15,6%
Yes driving license [18-84]	Bicycle	780	2,0%
	Car	37.982	95,3%
	Mopeds	47	0,1%
	Pedestrian	599	1,5%
	Public Transport	456	1,1%